Section 641
Issue No. 4
April 1973

CONSTRUCTION OF BURIED PLANT

CONTENTS

1. GENERAL

1.1 This section is intended to provide REA borrowers, consulting engineers, contractors, and other interested parties with technical information in the design and construction of REA borrowers' telephone systems. It covers in particular considerations in the construction of buried plant.

1.2 Some of the work items associated with buried plant construction are as follows:

a. Preinstallation inspection of cable and wire
b. Plowing-in cable and wire
c. Placing housings
d. Lateral trenching of cable and wire to housings or poles
e. Tamping of trenches
f. Splice enclosures and encapsulations
g. Splicing of cable and wire and connecting shield bonds and grounds
h. Terminating service wire directly to cable conductors
i. Constructing aerial inserts
j. Placing service wire or drops
k. Placing loading coils, bridge tap isolators, and building-out capacitors
l. Installing cable and wire moisture blocks
m. Placing route directional markers on housings
n. Placing route and terminal numbers on housings and poles
o. Acceptance test

1.3 Information for the design and staking of buried plant is contained in TE & CM Section 640, "Design of Buried Plant," and TE & CM Section 642, "Staking of Buried Plant." Detailed plans and specifications for construction of buried plant are contained in REA Form 511 entitled "Telephone Systems Construction Contract" and REA Form 511a entitled "Specifications and Drawings for Construction of Pole Lines, Aerial Cables and Wires, Buried Cable and Wires; and Station Installations."

2. SUPERVISION OF CONSTRUCTION

2.01 The construction of buried plant requires close supervision. The rapid rate at which plowing and trenching operations normally proceed and the fact that wire and cable are being buried directly in the ground where they cannot be visually inspected after installation make it imperative that a competent representative of the engineer or owner be with the plow at all times during the plowing operation to supervise construction. In order to inspect a sample of the cable or wire after it has been plowed, the plow should be advanced 10 feet past a housing location and stopped. A length of cable or wire may then be pulled through the plow's feed tube, back through the slot and over to the pedestal. This provides an opportunity to inspect a short length of wire or cable for damage. Particular care must be exercised in the bending radius of the cable or wire. (See Paragraph 2.02). When a contractor has more than one plow operating at a time, it is necessary to have an engineer with each plow at all times during the plowing operation. During the installation of wire and cable it may be necessary to hold up the plow pending the engineer's decision concerning proposed changes in the construction of route from that shown on the staking sheets. Undue delays caused by an engineer not being available to make such decisions are costly to the contractor and should not be permitted.

2.02 The minimum radius of bend for cable and wire should not be less than ten times the outside diameter of the cable or wire. If the cable or wire is bent too sharply, the shield and/or jacket of the cable or wire may be damaged.

2.03 Under the requirements of Form 511a the contractor and engineer shall jointly inspect all full and partial reels of nonpressurized nonfilled cable and wire for the presence of water prior to installation. In addition, filled and nonfilled cable or wire ends shall be kept sealed at all times, i.e., during transportation, in storage and during cable placement to prevent moisture entry into the cable core. Cable end caps shall be used for this purpose.

2.04 The resident engineer and the contractor should inspect the buried plant route ahead of the plowing operation. When selecting the detailed location of the buried plant, maximum consideration should be given to the convenience and ease of installation for the contractor

so long as the quality of construction, which would affect future ope tion and maintenance of the telephone system, is not decreased and construction costs to the owner are not increased.

2.05 It is of utmost importance that the engineer continuously inspect the cable and wire as well as the installation equipment and procedures during installation to guard against damage to the cab and wire while it is being placed in the ground, and to see that prop depth is maintained at all times. Caution should be exercised to prevent damage to the cable and wire due to slippage of the cable or wire in the ground as the plow leaves the starting pit. Cables and wire should be checked for damage at sudden or severe changes in grad or where the plow is violently impaired in movement (such as striking a large rock). Generally, facilities are more susceptible to damage during trenching operations and backfilling than they are when being plowed into the ground. The engineer should make certain that the wi or cable is properly placed in the open trench, that the trench is properly backfilled, and the surface of the ground restored. The tre should be backfilled and tamped where necessary to provide a solid ba for the cable or wire to rest upon between the plow slot and the housing. At the housing location, the earth should be properly tampe so that it will conform to the radius of bend of the cable. If this procedure is not followed, the cable or wire may sag downward from it attachment within the housing as the earth settles and possible damag to the conductors may occur within the housing. All trenches are to be promptly backfilled with earth and mechanically tamped at six (6) inch lifts so that the earth is restored to original grade to assure no hazard to vehicular, animal, or pedestrian traffic because of future settlement. NOTE: In those areas where experience has shown that water added to the backfill (flooding) will achieve compaction, (usually in sandy soil), this approach may be used as an alternate to mechanical tamping. Unprotected and unmarked trenches are not to be open overnight.

2.06 The work should be so organized that the trenching and/or plowing, together with the placement of cables and service wires, and the placement of housings and other associated functions will be done concurrently. In this manner, the interval from start to completion of any section of the project is held to a minimum. The enginee with each plow may not have time to inspect details of related work being performed behind a plowing operation, such as trenching, backfilling, tamping, housing installations, housing rodent protection, splicing, conductor terminations, and station installations. Therefor it may be necessary that the engineer have additional inspector personnel to supervise and inspect all such construction. The number of inspectors necessary depends upon the amount of proposed construct and the number of different operations being performed simultaneously

2.07 The engineer should take into account any rerouting of reel-end splices that have been placed which might change the proposed location of loading coils. Because of the limited deviation in load coil spacing permitted, it is recommended that the contractor perform cable laying operations on all loaded lines, starting at the central office and advancing in the direction of the loaded line with a continuous operation to the last load point on each loading section unless otherwise approved by the engineer. Deviations from this procedure should be approved in lieu of holding up the contractor in the event of late cable deliveries, etc.

2.08 The wire and cable are provided with sequential markings on the outer jacket to facilitate proper spacing of loading coils and to facilitate inventory of cable and wire units. The engineer and contractor should agree on the inventory of buried units when they are installed. Staking sheets should be appropriately marked so they may be used to make permanent records of all plant items.

2.09 The surface of the road or ground that plowing equipment has passed over should be inspected to determine if the surface is damaged and if so has been properly restored. Any repairs necessary should be performed in accordance with the requirements of Federal, state, or local authorities, and as set forth in the Telephone Construction Contract, Form 511.

2.10 Housings must be inspected to see that they are properly placed, conductors are correctly terminated, shields of wire and cable are bonded together (using the proper tool) and grounded when required, and wire and cable are marked with proper directional identification. Housings and poles should be inspected for correct route and housing or pole numbers, that the driven stake or stub poles are properly installed at sufficient depths and rodent protection in housings is installed in accordance with the REA Form 511a.

2.11 Buried splices and enclosures must be inspected during construction to ensure proper splicing and bonding, and proper installation of splice enclosures. In the installation of encapsulated splices it is necessary that this operation be closely observed to ensure that the cable jackets are properly prepared and the encapsulating material is properly mixed and applied. Non-encapsulated or nonfilled splice cases must be flash tested prior to backfilling. Where so indicated by the engineer, the buried splice will be protected by placing a treated plank directly over the splice enclosure and six inches above it, or placing the enclosure in a splice box or hand hole. This is normally required where it is anticipated that reentry into the splice enclosure will be necessary in the future.

2.12 To facilitate future reinforcements which may be required on the project, the staking sheets should be marked accurately so that the construction crew, which will be doing the reinforcing at a later date, will know approximately where the wire or cable and all other associated units were previously placed. If some depth greater than that normally required in the plans and specifications has been specified to facilitate future reinforcing or to provide a greater degree of protection from foreign workmen, the engineer should make certain that such depths are achieved.

2.13 All splice enclosures, trenching and other labor and materials associated with the making of reel-end splices are included in the BJ, BJF, BWF, or BWL unit. Therefore, such enclosures are not covered in the final inventory for compensation purposes. Although they are not inventoried, all splice enclosures and cable lengths should nevertheless be shown on the staking sheet for the purpose of determining load coil spacing. For ease of location in the future, all buried splices should be located a measured distance with respect to the center of the road or from some other permanent marker. All housings or buried splice enclosures which are installed for the purpose of repairing cable damage during the construction operation should also be shown on the staking sheet.

2.14 In situations where rock conditions make plowing-in of the wire and cable impractical or inadvisable, the engineer should consider trenching, aerial inserts, or rerouting. The determination is normally made during the construction period.

2.15 The cable route should be cleared only to a width sufficient for the passage of cable placing equipment. The responsibilities in regards to obtaining, operating upon, clearing of obstructions, (trees, brush, etc.), disposal of debris, and restoration of public or private right-of-way, including any compensations therefore are defined in REA Form 511a.

2.16 Special care should be exercised to avoid damage to fences, trees and shrubs. Disturbance of the ground surface by heavy apparatus should be kept to a minimum. All fences removed or cut for access of equipment are to be repaired promptly in accordance with requirements contained in REA Form 511a. In pasture or range land, gates should be closed and fence openings repaired as soon as possible.

2.17 Plowing or trenching operations within the area of subsurface structures should be carried on in a manner that will avoid accidental contact of the digging tools with such structures. The machines which may be used should be operated only by qualified personnel. When foreign structures are encountered, observe the following

practices unless otherwise indicated by local or utility authorities, or the latest issue of the National Electric Safety Code:

2.171 *Buried Power Cable: Where random separation is not permitted the buried telephone cable may cross above or below, perferably above, buried power cable. In either case, the power and telephone cables are to be separated by 12 inches of well-tamped, fine-earth or 3 inches of concrete. Where concrete is used at crossings it should be at least 3 inches by 4 inches in cross-section and extend along the power cable on both sides of the point of crossing to points at least 24 inches away from the telephone cable.

2.18 The minimum depth requirement for buried cable and wire is set forth in REA Forms 511 and 511a. In special situations it may be desirable that buried wires and cables be placed at a depth greater than 24 inches.

2.19 Situations may arise where the buried service wire may require additional protection from physical damage where the wire is attached to a building or exposed in air space. Rigid vinyl in the form of tubes or closed "U" shapes are available for this purpose.

3. CHARACTERISTICS OF TRACTOR AND PLOWING EQUIPMENT.

3.1 The engineer must be familiar with the characteristics and capabilities of the prime movers and plow equipment used in the installation of buried cable and wire plant. The equipment used on the job shall be subjected to the requirements stipulated in REA Forms 511 and 511a, and approval of the public authorities having jurisdiction over highway and road rights-of-way. The engineer must give due consideration to the size and maneuverability of construction equipment in his selection of the wire and cable routing.

3.2 The static type tractor

3.21 The power capabilities of prime movers may be stated in either terms of drawbar horsepower or drawbar pounds pull. The direct gear drive tractors are normally rated in terms of drawbar horsepower and tractors with torque converters are normally rated in terms of drawbar pounds pull at a given forward speed. The terms drawbar horsepower and drawbar pounds pull are the reserve tractive horsepower and

---

*For installation requirements for Joint Electric and Telephone Cable or Wires utilizing "Random Separation", refer to TE & CM Section 640

the reserve tractive force respectively available beyond that required to move the tractor itself.

3.22 Rubber-Tired vs Crawler Type Tractors: In the crawler tractor, the factors influencing traction are the width and length of the track and the type of grousers used. Grousers are metal ribs attached to the tracks to penetrate and grip the soil. Suitable grousers are required to ensure that traction is obtained by shearing the soil and not by the friction of metal on soil alone.

3.23 In general, the longer the track, the wider the track and the higher the grouser--the greater the traction.

3.24 On the rubber-tired tractor, the factors influencing traction are weight and weight distribution; tire size, inflation pressure and tread pattern; and track and wheel base.

3.25 For traction in various soils, a choice of various widths and lengths and depths of tracks may be obtained on crawler tractors and a choice of tires and inflation pressures on rubber-tired machines. The machines used may operate in conditions varying from the extremes of solid rock to swamp-like soil, and weather conditions from drought to floods and frost.

3.26 The data given in the following table indicates that both rubber-tired and crawler type tractors have very little tractive force in sand as compared to clay. However, the pounds pull required to place cable at a given depth in sand is much lower than that required for clay.

APPROXIMATE TRACTIVE FORCE OF CRAWLER RUBBER-TIRED TRACTORS

Type Surface	Force developed based on 30,000 # tractor (pounds)	
	Crawler	Rubber-Tired
Dry Sand	9,000	9,000
Wet Sand	12,000	12,000
Loam	22,500	13,500
Clay	31,500	22,500
Concrete	13,500	27,000

It will be noted that neither the crawler nor the rubber-tired tractor is superior under all conditions but each is superior under certain conditions

3.27 Rubber-tired machines are more difficult to keep on a straight course than are crawlers, particularly on slopes, and both the types of transmissions and the means of steering the rubber-tired machines influence this. The transmissions available for rubbered-tired are clutch-brake, and differential and limited slip differentials, with clutch-brake machines being steered by skidding the wheels and the differential drive machines having steerable wheels at the front or the rear or all around.

3.28 If rubber-tired tractors are used for plowing work, the all-wheel drive rubber-tired machine with all wheel steering fitted with limited slip differentials is preferred because the oblique steering properties tend to offset any tendency to slip sideways on slopes. The rear wheel steer machine is very difficult to keep on a straight course when the plow is in the ground.

3.29 Cable is usually plowed along the most suitable route, whether it is along the shoulder of the road or on private right-of-way across farming or grazing land. In many areas, the landowners are reluctant to consent to the use of the heavy equipment on their land. Even when the cable track has been seeded it may be some time before the land looks fully recovered. <u>Crawlers do far less surface damage than rubber-tired tractors</u>. The crawler tractor used must have sufficient power and traction (weight) so as to minimize track slippage. Landowners and public authorities may frown upon surface damage caused by track slippage. On the other hand, when machines have to be moved across hard surface roads and the like, the rubber-tired machine does no damage while the unprotected crawler does.

3.3 The Vibratory Type Tractor and Plow

3.31 The characteristics of the vibratory plow are such that the drawbar pull requirements as stipulated in REA Forms 511 and 511a are not entirely applicable. The principle of the cutting and vibrating reduces the drawbar pull, as related to the static type plow train, as much as 80 percent in some soil conditions. In addition, since prime mover weight is dictated by drawbar requirements and not engine size, a significant reduction in prime mover weight and size is achieved through plow vibration. However, drawbar requirements for vibratory plow prime movers increase as the plowing speed increases and, therefore to obtain full advantage of plow vibration, plowing speed is usually relatively low. Thus for a prime mover drawbar capability a vibrating plow will settle to a speed that depends on soil conditions.

3.4 Plow Equipment

3.41 Considering the direct mounted and towed plows both for the

vibrator and static types, an advantage in using a towed plow is that the tractor can be a general purpose machine available for other purposes. In operation, the towed plow can be unhitched for crossing soft patches, swamps and streams and winched across with the tractor standing on hard ground. Over undulating ground it does a better job of maintaining the cable at proper depth than some of the tractor mounted plows. Generally, however, the tractor mounted unit is superior. It is easily maneuvered and it may rely on the weight of the tractor for positive holddown rather than dead weight. Any dead weight placed on the towed plow in order to achieve 15,000 pounds downward force may use some of the tractor's power necessary for plowing. With proper design, the depth of laying with the direct mounted unit can be accurately controlled. Areas where the ground is too soft to give traction can be avoided or, if this is not possible, a second tractor with a winch is used as an anchor.

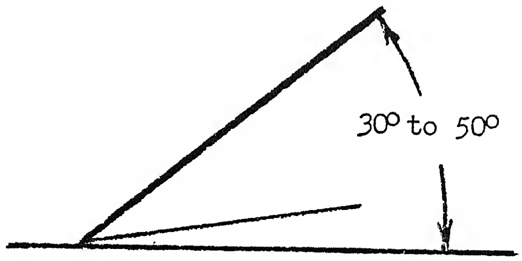
3.42 The direct mounted unit is inherently more stable. The reaction at the towbar of the tractor pulling a separately mounted plow tends to lift the front of the tractor off the ground. However, the stability of the tractor increases as its own weight is increased but decreases as the drawbar pull increases. On the other hand, the stability of the tractor with a directly mounted plow increases as the drawbar pull increases and the resistance offered by the earth to the plow increases.

3.43 The ideal plow should be so designed that the cable leaves the plowshare at the approximate same height above the bottom of the plowed slot regardless of the depth. A disadvantage to this type plow is that the cable may be damaged due to abrupt changes in elevation when passing over rocks, etc. One way to overcome this is by using parallelogram type linkage.

3.44 If hydraulic rams are used to transmit part of the tractor's weight to the plow for positive holddown they should be double acting and capable of raising the rear of the tractor with the plow-point resting on the ground.

3.45 The equipment should be capable of extending the plow blade to a depth of at least 36 inches when the tractor is angling across and along drainage ditches or rough terrain. The plow-point, leading-edge (shin), share-shape, and share-width should be designed to cut a narrow slot through the earth without disturbing the soil excessively. A broad "V" leading-edge equal to the share's thickness has been found to perform satisfactorily. (See Figure 1 for sketch of typical cable plowshare.) Test results have shown that the proportions and the angle of attack of the point have the greatest effect on drawbar pull and pull-down. This means that a properly designed plow with a vertical

shin (Figure 3) or a shin that angles back from the plow-point (Figure 2) pulls the wheels down and tends to stay in the ground better than plows designed with a shin angling towards the point (Figure 4). For most soils and rock it has been found that the best angle of penetration for the plow point is 30° to 50° from the horizontal.



Prefered Angle of Plow Point Penetration

3.5 Capability: One tractor can satisfactorily pull a plow most of the time. However, experienced contractors have found that a second tractor is justified for providing additional traction in soil that is hard to plow, and for pulling the first tractor through muddy and other difficult areas. Track type prime movers generally provide better flotation and more positive traction than the rubber-tired types The prime mover used to draw the plow should be the larger of the two and should have a minimum rating equivalent to 30,000 drawbar pounds pull at 1.2 miles per hour or 130 drawbar horsepower at the rated engine speed.

3.51 When difficult plowing is encountered, the equivalent of at least 250 drawbar horsepower should be applied to the plow before aerial inserts, rock trenching or major rerouting are considered. Since this is a very large amount of power, good judgement should be exercised to prevent unnecessary or undue damage to the terrain caused by upheaval of large boulders.

3.52 It is recommended that the second tractor be equipped with a winch and a blade. This tractor may then be used for necessary right-of-way clearing and cleanup when it is not required to assist the prime mover. However, the second tractor must be nearby to provide more power when required.

3.53 Following the plowing-in of wire or cable, the plow slot must be compacted. It is suggested that the following method of compaction be considered: Run the tractor track or tire along and immediately adjacent to both sides of the plow slot; fill in any

FIGURE 1

A TYPICAL CABLE PLOWSHARE

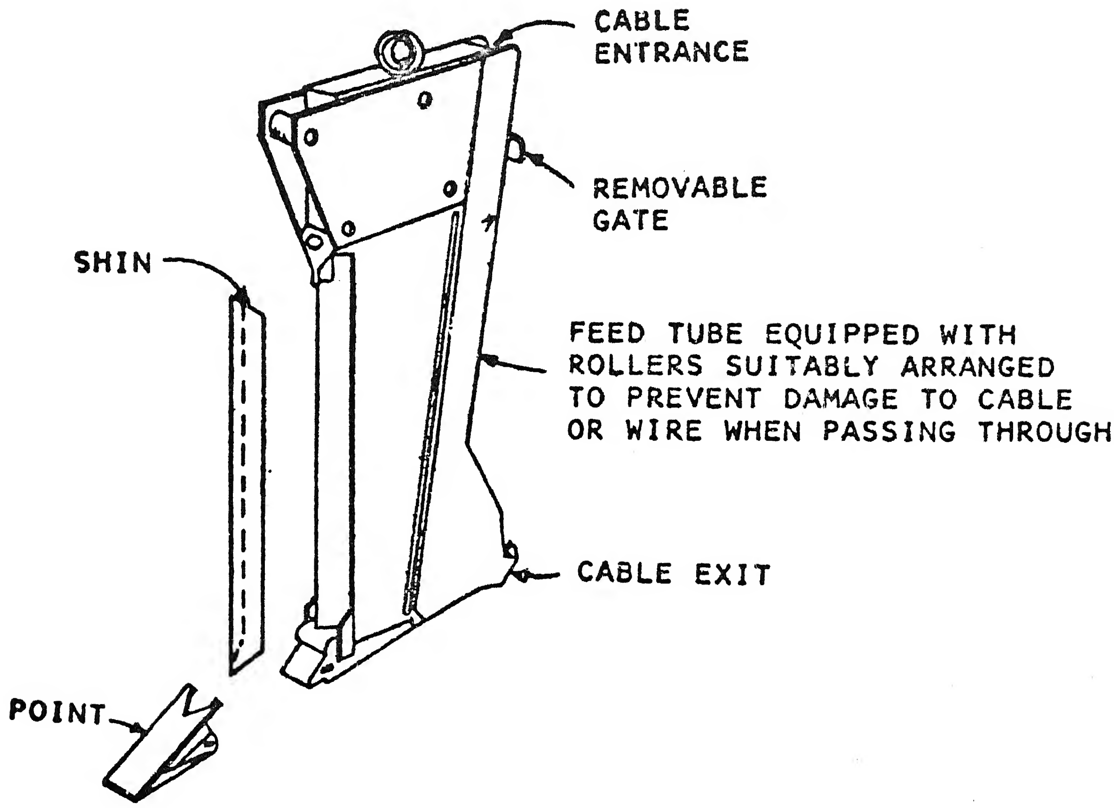


FIGURE 2

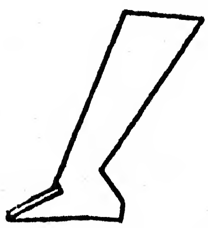


FIGURE 3

(PREFERABLE)

FIGURE 4

ground depressions which may develop with earth to form a mound over the center of the plow slot; and then run the track or tire over the center slot. Different soil conditions may warrant that other methods of compaction be employed.

3.54 There is a real need for a method of signaling between the man riding the plow and the tractor operator. This is necessary not only to prevent damage to buried cable and wire, but also to minimize the possibility of injury to personnel. Since the man riding on the plow is the only one who can see the sequential markings on the cable or wire jacket while the plow is in motion, he must have a means of signaling the tractor operator to stop when he approaches the point for installing an access point. The alarm device must attract the attention of the tractor operator over the operating noise of the tractor. This might require a loud alarm bell with a flashing light.

4. HANDLING AND CARE OF MATERIALS DURING CONSTRUCTION

4.01 It is most important that extreme care be exercised in handling materials during construction. As required by REA Contract Form 511, the contractor provides competent supervision on the plow at all times to ensure that the buried wire or cable is fed through the plow into the ground at zero tension. Under no circumstances should <u>the tension be allowed to develop in the wire or cable</u>.

4.02 Whenever the plow is stopped, sufficient wire or cable is to be unreeled to guard against sudden jerks when the plow is started.

4.03 Extreme caution must be exercised to be sure that the plow is not backed up while the blade is in the ground. Experience has shown that wire and cable can be severely damaged by the plow backing up even a <u>slight</u> amount. During the plowing operation, the plow may strike a buried object or rock that would stop the equipment and necessitate removal of the plow from the ground. If this should occur, the plow should be removed carefully <u>without backing up</u>. Should it be necessary to take back the plow, the wire or cable must be uncovered a sufficient distance back from the plow for inspection by the engineer to determine if there is any damage. Any damage discovered must be repaired under the direction of the engineer. See Form 511a.

4.04 Care must be exercised to prevent damage to exposed cable or wire during the construction period. Work should be scheduled to keep such exposure to a minimum. Where wire or cable is being placed along the shoulder of a road, all trenching and backfilling for both inline and short lateral trenches should be completed each day so as not to leave the wire or cable exposed overnight. Exposed wire or cable is susceptible to damage, and it also constitutes a hazard to vehicles, pedestrians, and animals.

4.05 Where housings are used, extreme caution must be exercised to avoid damage to wire or cable when joining lateral trenches to the slot made by the plow and in installing housings or poles and forming cable at pedestals and poles in accordance with the construction drawings. The stake or pole portion of the housing should be installed before the wire or cable is placed in the trench.

4.06 Sufficient crews should be provided by the contractor to assure that the wire or cable is installed in the housings as soon as practicable. The work should be completed within one week after the wire or cable has been plowed or trenched into the ground. However, no trenches or other excavations are to be left open overnight unless they are protected by means designated by the engineer.

4.07 Repair of Facilities Damaged During Construction

4.071 Minor damage to the outer jacket, where the shield of the wire or cable has not been bent, abraded, or penetrated, may be repaired, if approved by the engineer. Minor damage is to be repaired in accordance with the appropriate provisions of REA Splicing Standard PC-2.

4.072 Where damage of a more serious nature occurs during construction, that is, where the outer jacket and the shield are penetrated, the damaged section should be enclosed in a buried splice enclosure, housing, or splice encapsulation. The outer jacket and the shield are to be removed from the damaged area as though preparing for a splice. The two ends of the shield are to be bonded together. If the inner jacket has been deformed or penetrated, the individual conductors of the wire or cable should be inspected for possible damage. Any damage to the conductors or their insulation should be repaired in accordance with the appropriate provisions of REA Splicing Standard PC-2.

4.073 Damage to wire or cable subsequent to burial, discovered either through test or observation, should be repaired by approved methods. This will normally involve the use of a buried splice enclosure or encapsulation, but may require the replacement of the damaged section of wire or cable and the use of two or more splice enclosures or encapsulations.

4.074 All housings, splice cases, or encapsulations added due to repair work or reel-end splices should be numbered and/or shown on the staking sheets. However, they should not be included in the inventory for compensation.

4.08 Preparation for Splicing or Termination

4.081 Buried cable and wire are to be spliced and enclosed in accordance with PC-2, "REA Standard for Splicing and Terminating Plastic-Insulated, Plastic-Jacketed Cables Used on Telephone Systems of REA Borrowers."

4.082 Moisture blocks as required in REA Forms 511 and 511a are to be installed in all nonfilled cables and wires within above ground housings to prevent the ingress of water or moisture into the cable and wire systems.

4.083 The covers for the buried cable and buried wire housings should be bolted in the closed position at the time the housings are installed and are to be kept in the closed position at all times except when work is being performed within the housings.

4.09 Special Procedures for Installing Filled Cables in Cold Weather

4.091 While filled and unfilled cables exhibit similar flexibility properties at normal operating temperatures, experience and testing have shown them to be affected differently when exposed to lower temperatures. Below 40°F the flexibility of filled cables is sharply reduced. For example, at temperatures below 40°F it requires almost twice the force to deflect filled cable to achieve the same deflection in a similar unfilled cable. The engineer and contractor should inspect the cables each morning to determine if the cables are flexible enough for plowing particularly in early spring and late fall when nighttime temperatures drop below 30°F. When cables are stored outdoors and have been subjected to cold nights, considerable time may be lost each morning waiting for them to warm up even though the day time temperature may be in excess of 40°F. During spring and fall of the year the cable may be stored in a heated warehouse prior to placement in underground or buried plant. The cables can then be transported to the project site as needed and installed while they are still flexible.

4.092 In addition, as temperatures decrease, the filling compound in the cable core cools and stiffens to such an extent that the cable pairs become increasingly difficult to separate. In general, installation below 40°F can be slow, difficult, possibly even halted unless special precautions are taken to offset the effects of the lower temperatures.

4.093 As mentioned above, the cable pairs become difficult to separa as the temperature decreases. At temperatures as low as 20°F, however, the pairs may be separated, when the cable ends are free, by flexing the core and separating a few pairs at a time. It is also interesting to note that at this temperature the filling compound is

not as messy to work with as at elevated temperatures. Consequently, after the pairs have been separated, the conductors can be spliced without any special effort to wipe them free of the filling compound.

4.094 Below 20°F it is recommended that some external heat source be used to help soften the filling compound so that the the pairs may be separated. A catalytic heater may be used in a splicer's tent to warm the cable sufficiently for splicing. Other sources of heat not involving a direct flame may also be used for this purpose.

4.10 Care must be exercised at all times when making connections to avoid placing dissimilar metals in contact (i.e., metals which are substantially separated in their position in the galvanic series of metals given in Table 1, REA TE & CM 670, "Corrosion Considerations in Outside Plant"). In buried plant construction the shield of the buried cable or wire is usually a different material than that of the housing and dissimilar metals contacting each other can result in electrolytic corrosion. Tinned grounding connectors are therefore used to connect shields to the ground at housings.

5. APPLICATION UNITS

5.1 A complete description of all buried plant assembly units is given in REA Form 511a. The engineer and contractor should be familiar with the description of each assembly unit and be aware of everything which is included in each unit.

6. APPLICATION OF AERIAL INSERTS

6.1 Aerial sections in buried plant should be used over streams and similar obstructions when, in the opinion of the engineer, the cable or wire cannot be placed by either plowing, machine trenching, or protected by the installation of guard assemblies. Every effort should be made to avoid this type of construction or keep it to a minimum. These aerial exposures are susceptible to storm damage and are usually exposed to power contacts. Therefore, a 24 gauge fuse link should be placed in the junction of the aerial cables with buried cables and wire.

6.2 All units of aerial plant, such as poles, guys, anchors, etc., required for aerial inserts in buried plant are specified by the engineer in accordance with instructions set forth in other appropriate sections of TE & CM.